2009

Rabies in Maricopa County

Department of Public Health
Office of Epidemiology
December 2010

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Introduction

In 2006, the Maricopa County Department of Public Health (MCDPH) developed and initiated a comprehensive surveillance system that tracks the number of rabies risk assessments conducted, types of exposures, risk factors, and number of individuals that received post-exposure prophylaxis. This report describes trends in rabid animals in Arizona and its counties, as well as the trends in human exposures to animals reported to MCDPH for rabies risk assessments in 2009.

To report a suspected rabies case or to receive a rabies risk assessment call MCDPH *(24 hours a day)***:**	
Members of the public	**602-747-7500**
Medical providers	**602-747-7111**

Rabies History

Rabies is a preventable viral disease of mammals that infects the central nervous system causing encephalopathy (brain dysfunction) and ultimately death in infected animals and humans. It can be transmitted from the bite of an infected animal or by contact with saliva, central nervous system (CNS) tissue, or cerebral spinal fluid in an open wound or a mucous membrane. The rabies virus is excreted through the saliva during the late stage of the disease, after rabies has affected the brain. During this period, an animal can transmit rabies to another animal or human. The incubation period (time from exposure to the virus to the development of clinical signs or symptoms) in humans is usually several weeks to months, but ranges from days to years. Early symptoms of rabies in humans are nonspecific, consisting of fever, headache, and general malaise. As the disease progresses in humans, neurological symptoms appear, which may include insomnia, anxiety, confusion, slight or partial paralysis, excitation, hallucinations, agitation, hyper-salivation, difficulty swallowing, and hydrophobia (fear of water). Death usually occurs within days of the onset of symptoms. There is currently no cure for rabies. Once a victim begins showing symptoms of infection, medical professionals can only provide supportive care. However, modern day post-exposure prophylaxis regimens, including the timely administration of Human Rabies Immune Globulin (HRIG) and rabies vaccine, have proven to be nearly 100% successful. In the United States human fatalities from rabies are very rare, but have occurred in people who failed to seek medical assistance, usually because they were unaware of their exposure.

Over the last 110 years, rabies in the United States has changed dramatically. The number of rabies-related human deaths in the United States has declined from more than 100 annually in 1900 to one or two per year in the 1990's. More than 90% of the rabid animals reported annually to the Centers for Disease Control and Prevention (CDC) were wild animals like raccoons, skunks, bats, and foxes as opposed to before 1960, when the majority were domestic animals.

The last documented human case of rabies in Arizona was in 1981 – this case was bitten by a rabid dog in Mexico. Currently in Arizona, the principal rabies hosts are bats, skunks, and foxes. Recent epidemiologic data suggest that transmission of rabies virus can occur from minor, seemingly unimportant, or unrecognized bites from bats. This makes bats the most concerning source of possible rabies infection in Arizona. In 2009, Arizona had the highest number of rabid animals recorded since surveillance started in 1999 with 280 animals testing positive for rabies (**Table 1**).

Table 1. Confirmed rabies positive animals in Arizona by year, 1999-2009*

	Bat	Skunk	Fox	Bobcat	Coyote	Cat	Dog	Other [Δ]	Total
1999	48	11	19	0	1	0	0	2	**81**
2000	65	17	15	1	1	0	1	1	**101**
2001	55	59	6	4	4	0	0	1	**129**
2002	56	44	33	3	2	0	1	4	**143**
2003	44	8	18	4	1	0	0	0	**75**
2004	75	24	17	2	2	0	0	0	**120**
2005	84	67	12	2	1	2	0	1	**169**
2006	96	16	22	3	1	1	0	1	**140**
2007	115	13	24	6	1	0	0	0	**159**
2008	89	51	21	7	4	0	1	3	**176**
2009	69	144	51	8	2	1	0	5	**280**
Total	**796**	**454**	**238**	**40**	**20**	**4**	**3**	**18**	**1,573**

*Source: Arizona Department of Health Services (ADHS) data

[Δ] Other includes 4 horses, 1 javelina, 3 llamas, 2 mountain lions, 3 cows, 2 badgers, 1 coati, 1 ringtails, and 1 raccoon

Since 1999, Pima County has consistently been the county in Arizona with the greatest number of rabies positive animals each year. Maricopa, Cochise, and Gila County frequently have greater than 10 animals per year test positive and all counties have had at least one animal test positive within the past 11 years (**Table 2**).

Table 2. Confirmed rabies positive animals in Arizona by year and county, 1999-2009*

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Apache	1	0	0	0	0	0	0	0	0	0	0	**1**
Cochise	5	12	10	23	18	9	13	5	7	12	39	**153**
Coconino	1	3	26	9	7	9	4	4	7	7	35	**112**
Gila	10	21	4	7	2	6	2	13	21	11	7	**104**
Graham	0	1	0	4	3	1	2	0	1	1	0	**13**
Greenlee	1	0	0	0	0	0	2	5	8	12	3	**31**
La Paz	0	0	0	1	0	1	1	0	0	0	1	**4**
Maricopa	18	13	14	10	11	12	12	9	17	23	13	**152**
Mohave	1	0	1	1	2	0	0	0	2	0	0	**7**
Navajo	2	0	0	0	1	0	0	2	1	0	0	**6**
Pima	29	34	42	34	22	64	107	81	79	65	86	**643**
Pinal	1	4	3	4	4	7	7	9	7	16	11	**73**
Santa Cruz	3	5	17	32	1	6	12	7	3	16	70	**172**
Yavapai	6	6	11	14	3	3	7	4	6	11	15	**86**
Yuma	3	2	1	4	1	2	0	1	0	2	0	**16**
Total	**81**	**101**	**129**	**143**	**75**	**120**	**169**	**140**	**159**	**176**	**280**	**1,573**

*Source: Arizona Department of Health Services (ADHS) data

The last documented case of rabies in a dog in Maricopa County was in 1977 and was vaccine-associated – that is, the disease was caused by the rabies vaccine given to the dog. The last non-vaccine-associated infection in a dog in Maricopa County was in 1973. The last documented case of rabies in a cat in Maricopa County was in 1982 and was also a vaccine-associated infection. Vaccine-associated infections no longer occur in the United States as the vaccine has been changed from a live attenuated vaccine to a killed virus vaccine. Because of the rarity of rabies in domestic animals in Maricopa County, exposures to cats and dogs are considered very low risk for rabies transmission. However, it is still important to contact a healthcare provider or public health department after an interaction with a cat or dog that may possibly transmit rabies, so that the individual situation can be assessed and appropriate measures can be taken.

The role of the Maricopa County Department of Public Health (MCDPH) is to conduct risk assessments for people who have had an interaction with an animal that poses a possible threat of transmitting rabies. MCDPH works in partnership with the Arizona Department of Health Services, Arizona Game and Fish Department, and Maricopa County Animal Care and Control to make sure county residents and the animals involved, receive appropriate treatment after an exposure. Rabies is a medical urgency but not an emergency. Decisions should not be delayed. MCDPH is available twenty-four hours per day, seven days per week to conduct immediate risk assessments and assist patients and medical providers with any questions they might have. Members of the public can reach MCDPH at **602-747-7500.** Medical providers can reach MCDPH at **602-747-7111**.

In Maricopa County, the majority of animals that test positive for rabies are bats (**Table 3**). Since bat bites can be relatively minor or even unrecognized, it is especially important that all human interactions with bats be assessed for the need to start rabies post-exposure prophylaxis. Other non-domestic animals, including skunks, fox, horses, steer, coyote, and bobcats have tested positive for rabies in Maricopa County since 1999. Human interactions with ANY wild animals should be assessed for the risk of rabies.

Table 3. Confirmed rabies positive animals in Maricopa County by year and animal, 1999-2009*

	Bat	Skunk	Fox	Other	Total Cases
2009	11		1	1 horse (North central skunk variant)	**13**
2008	21			1 coyote (Arizona gray fox variant) 1 horse (Big brown bat variant)	**23**
2007	16			1 bobcat (variant typing not performed)	**17**
2006	9				**9**
2005	11			1 bobcat (Arizona gray fox variant)	**12**
2004	9		2	1 bobcat (Arizona gray fox variant)	**12**
2003	10		1		**11**
2002	10				**10**
2001	13			1 coyote (Arizona gray fox variant)	**14**
2000	13				**13**
1999	12	5		1 steer (male cow/ox)	**18**

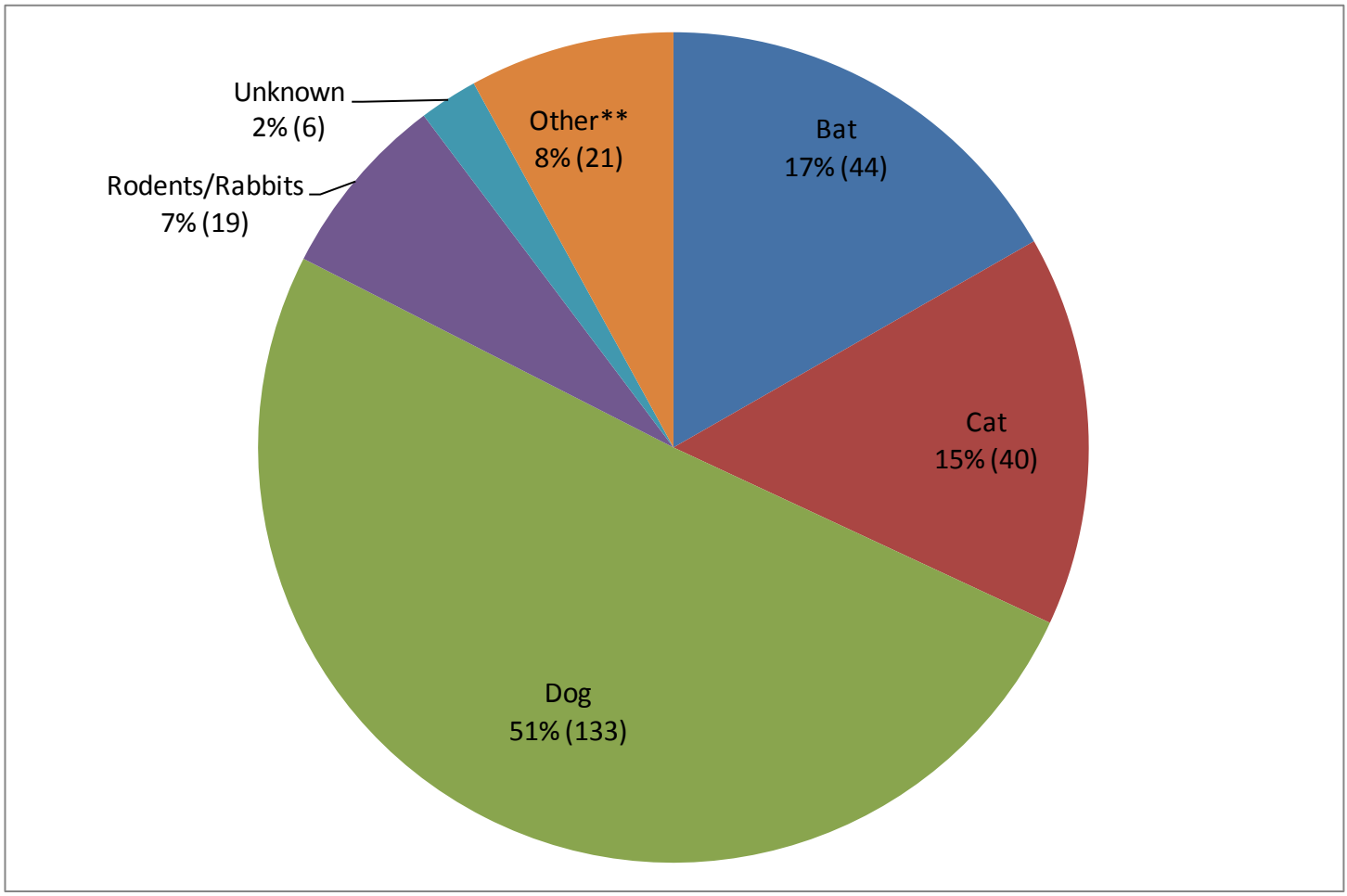
*Source: Arizona Department of Health Services (ADHS) data

Rabies Risk Assessments in Maricopa County

MCDPH conducts rabies risk assessments for individuals that may have come in contact with a potentially rabid animal. A risk assessment weighs the potential adverse consequences associated with administering post-exposure prophylaxis against the risk of the person acquiring rabies from their exposure. Risk assessments should be conducted in each situation involving a possible rabies exposure. Risk assessments consider the following factors: type of exposure, epidemiology of animal rabies in the area where the contact occurred, species of animal, and circumstances of the exposure incident.

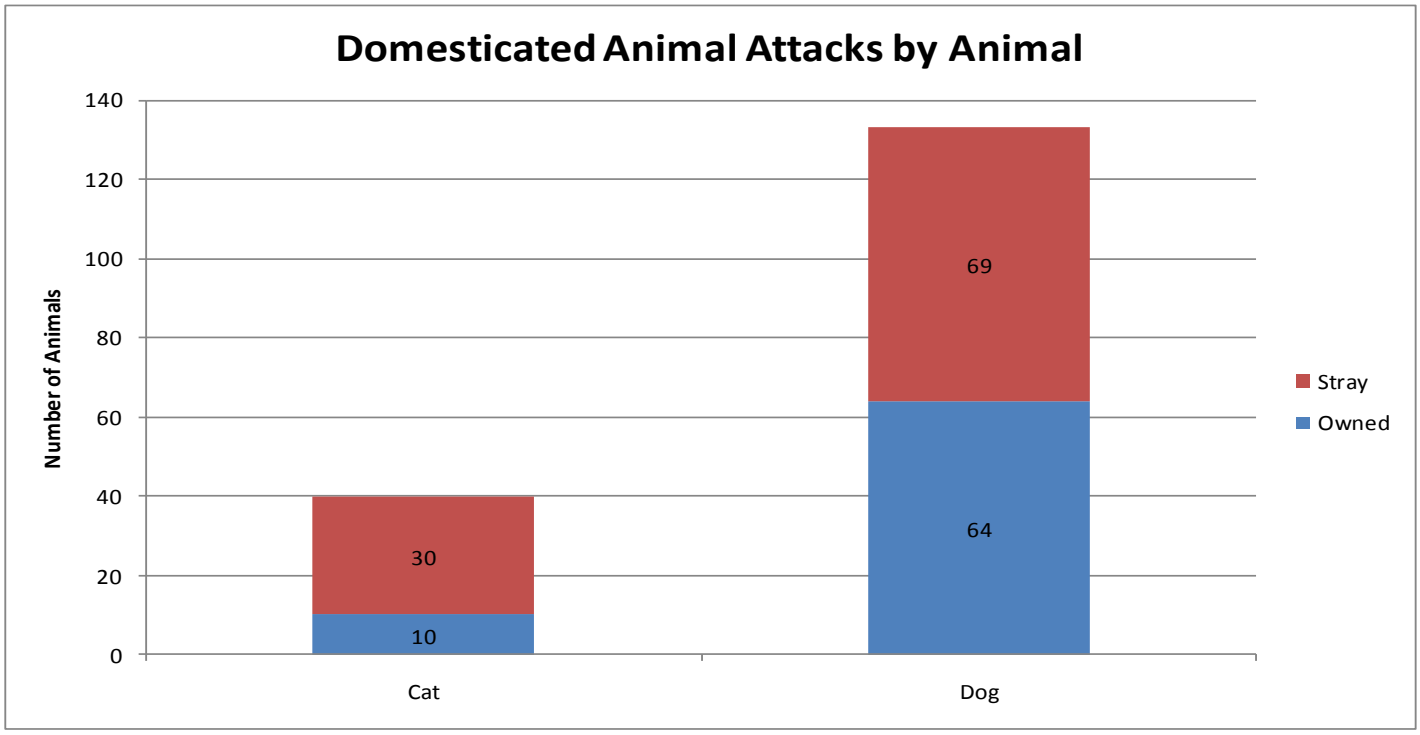
In 2009, MCDPH conducted 263 rabies risk assessments for people that had a potential exposure to domestic or non-domestic animals. As seen in **Figure 1**, over half (51%) of the risk assessments conducted were for exposures to dogs and 17% were for exposure to bats. **Figure 2** shows the number of risk assessments conducted for human interactions with domestic animals (dogs or cats) only. The majority of these animals were stray (75% of cats, 52% of dogs). MCDPH conducted 84 rabies risk assessments for exposures to non-domestic animals in 2009 (**Figure 3**). Of these 84 assessments, 44 (52%) were for human encounters with bats.

Figure 1. Human exposures* to all animals reported to the Maricopa County Department of Public Health for rabies risk assessments in 2009 (n = 263)



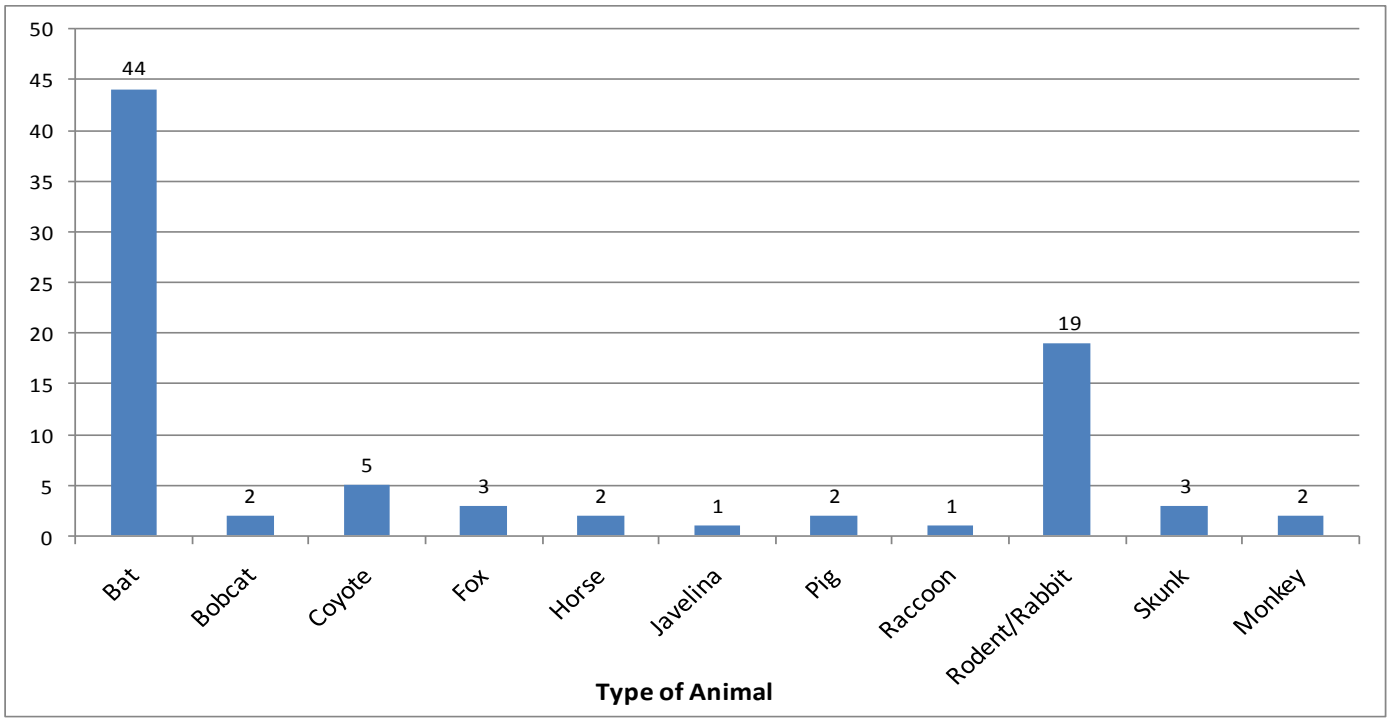
† *Source: Maricopa County Department of Public Health (MCDPH) data*
** Note: The numbers graphed here reflect the total number of assessments done, regardless of exposure risk.*
*** "Other" includes: No Exposure (1), Bobcat (2), Coyote (4), Fox(3), Horse (2), Javelina (1), Pig (2), Raccoon (1), Skunk(3), and Monkey (2)*

Figure 2. Human exposures* to domestic animals reported to the Maricopa County Department of Public Health for rabies risk assessments in 2009 (n = 173)†**



† *Source: Maricopa County Department of Public Health (MCDPH) data*
** Note: The numbers graphed here reflect the total number of assessments done, regardless of exposure risk.*
*** Risk assessments without an "unknown" animal exposure are excluded from Figure 2 and Figure 3.*

Figure 3. Human exposures* to wild animals and livestock reported to the Maricopa County Department of Public Health for rabies risk assessments in 2009 (n = 84)†**



†*Source: Maricopa County Department of Public Health (MCDPH) data*
**Note: The numbers graphed here reflect the total number of assessments done, regardless of exposure risk.*
*** Risk assessments with an "unknown" animal exposure are excluded from Figure 2 and Figure 3.*

Exposure vs. Non-Exposure

An exposure is any bite, scratch, or other situation where saliva, central nervous system (CNS) tissue, or cerebral spinal fluid of a potentially rabid mammal enters an open wound, non-intact skin, or comes in contact with a mucous membrane by entering the eye, mouth, or nose (or mucous membranes of genitalia). **In order for transmission to occur saliva or CNS tissue has to penetrate the skin or enter through mucous membranes.** Transmission through organ transplantation has also occurred in very rare circumstances.

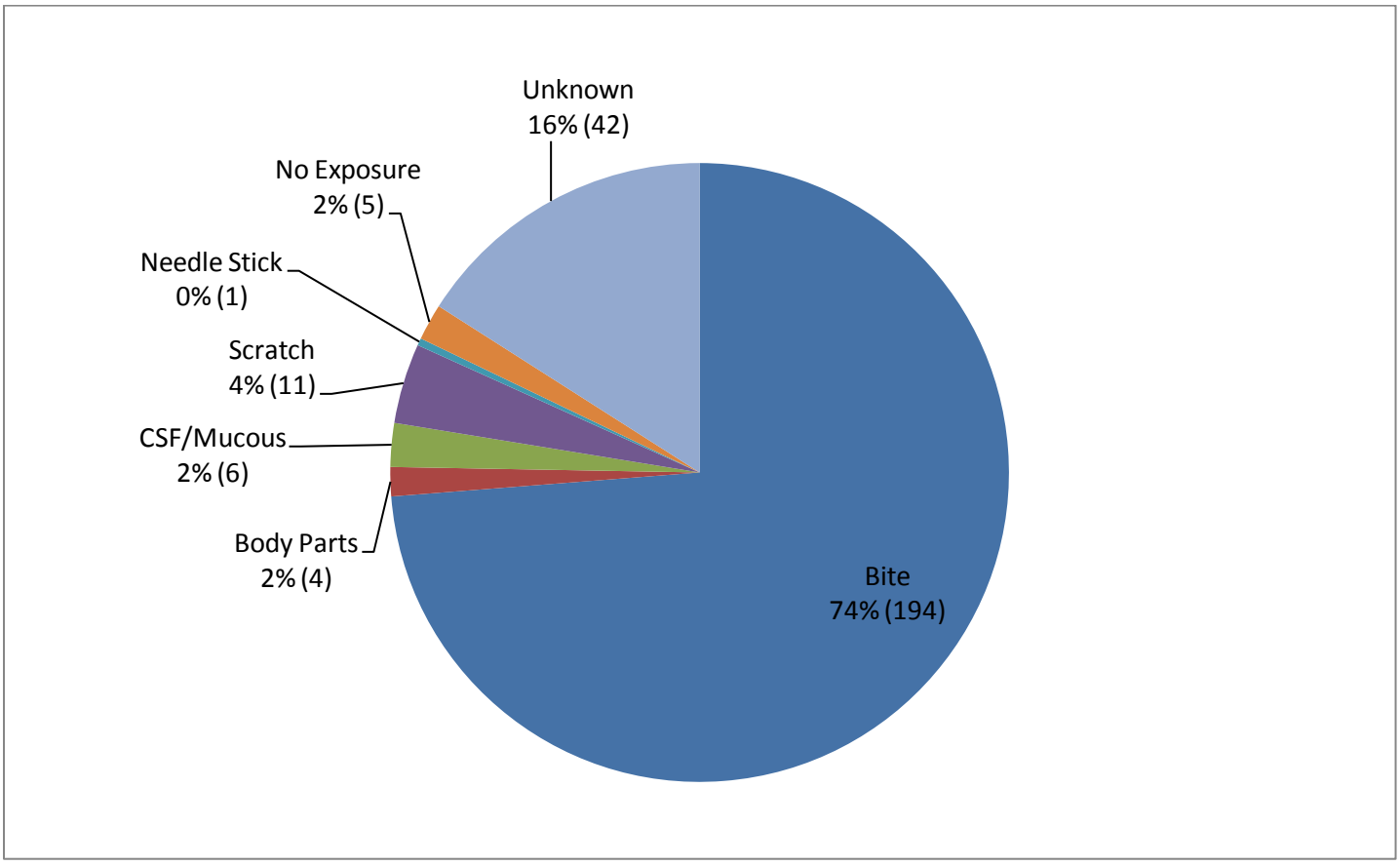
The touching or handling of a potentially rabid animal or an inanimate object that had contact with a rabid animal does not constitute an exposure unless wet saliva or CNS material from the rabid animal entered a fresh wound, non-intact skin, or a mucous membrane. Contact with blood, urine, feces, or dried saliva on objects does not constitute an exposure. A bite from a rodent such as a squirrel, hamster, mouse, rat, rabbit, or hare does not constitute an exposure, except in unusual circumstances. Unusual circumstances include: a wild rodent or rabbit that exhibits acute neurological signs per a veterinarian or a domesticated rodent or rabbit housed outside that survived an attack through the cage by a potentially rabid animal. These cases should be evaluated individually by a public health staff member to determine if an exposure has occurred.

Bite vs. Non-Bite

A bite is any penetration of the skin by the teeth of an animal. Any bite, regardless of its site or severity, could be a potential exposure. Bites to areas with a large number of nerves, such as the face, neck, and/or hands may be quicker to progress to the symptomatic phase of rabies. The site of the bite should not influence the decision whether or not to receive post-exposure prophylaxis. However, the site and severity of a wound should influence the decision whether to start treatment immediately or await quarantine and/or rabies test results. Recent epidemiologic data suggest that even the very minimal injury inflicted by a bat bite (compared to lesions caused by terrestrial carnivores) should prompt consideration of immediate post-exposure prophylaxis unless the bat is available for testing. Most human exposures to animals reported to MCDPH for assessment in 2009 were bite exposures (**Figure 4**).

The contamination of open wounds, abrasions, mucous membranes, or theoretically, scratches, with saliva or other potentially infectious material (such as neural tissue) from a rabid animal constitutes a non-bite exposure. In all instances of potential human exposures involving bats, if the bat is not available for testing, post-exposure prophylaxis might be appropriate even if a bite, scratch, or mucous membrane exposure is not apparent. However, in these circumstances there should be a reasonable probability that an exposure might have occurred.

Figure 4. Human exposures to all animals reported to the Maricopa County Department of Public Health for rabies risk assessments in 2009 by type of exposure (n = 263)†



†*Source: Maricopa County Department of Public Health (MCDPH) data*

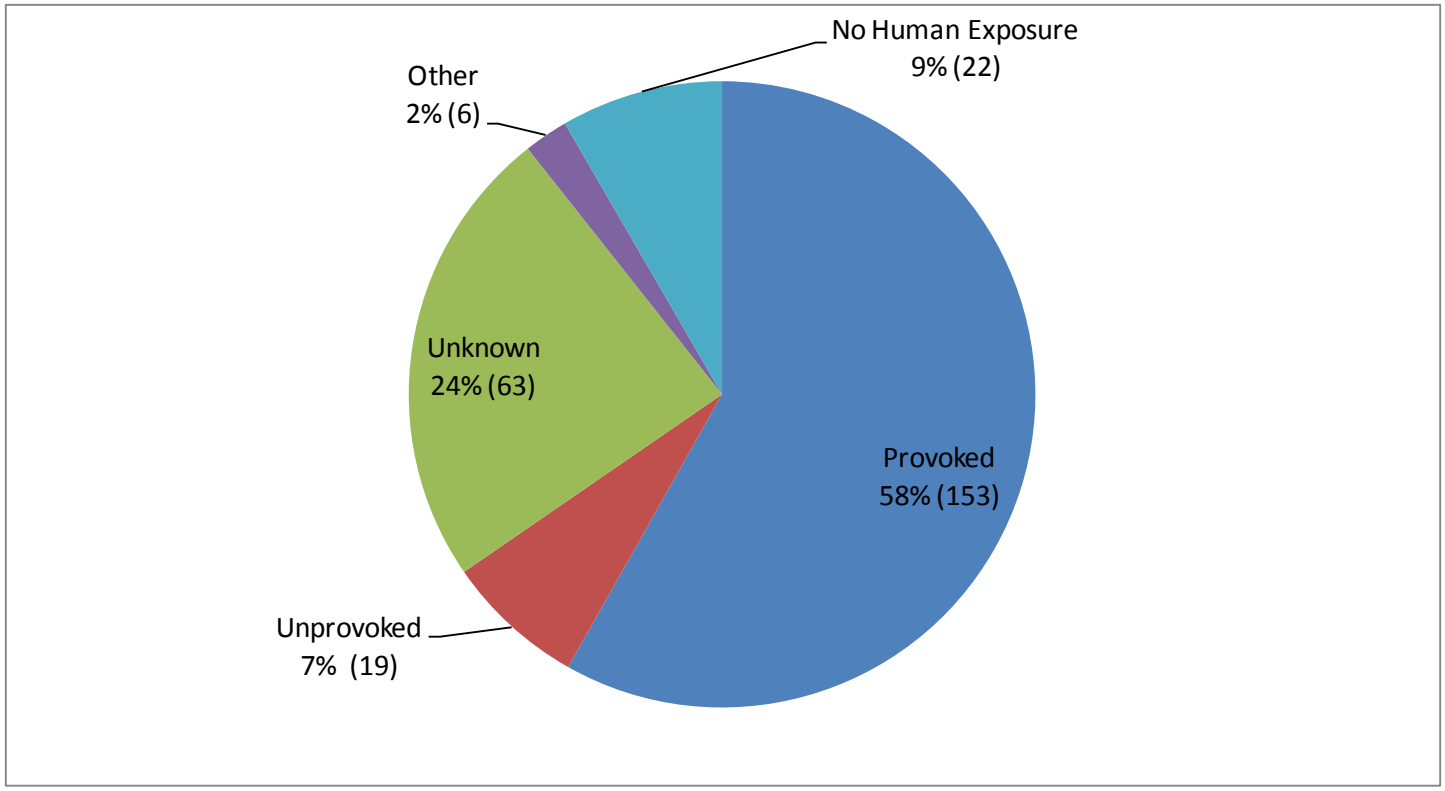
Provoked vs. Unprovoked

An animal may be provoked by: yelling, chasing, running from, striking, taunting, frightening, or generally bothering an animal in such a way that induces the animal to become aggressive. Other situations which may provoke an animal include: entering a domestic animal's yard or space, approaching an animal while it is eating or sleeping, approaching an animal with its young, approaching an animal that has impaired vision, hearing, or mobility, or handling an animal in such a way that could elicit a pain response - i.e. grabbing, hitting, poking, pulling, scratching, kicking, or stepping on. Approaching or petting a stray, feral, or wild mammal is also considered sufficient to provoke a bite, as it is entering an animal's territory.

Situations that would be considered to be unprovoked include an attack by an animal that is aware of an individual's presence and the individual is not approaching or menacing the animal , non-offensive manner or an attack by an animal that is acting sick, exhibiting abnormal behavior, generally seems unhealthy, or a wild animal that has no fear of humans.

Most of the human exposures to animals reported to MCDPH in 2009 were considered to be a result of a provoked attack (**Figure 5**).

Figure 5. Human exposures to all animals reported to the Maricopa County Department of Public Health for rabies risk assessments in 2009 by type of animal exposure (n = 263)†



†*Source: Maricopa County Department of Public Health (MCDPH) data*

Prophylaxis

Pre-Exposure Prophylaxis

Humans may receive rabies pre-exposure prophylaxis for several reasons. Rabies research laboratory workers and rabies biologic production workers should receive pre-exposure rabies vaccine. Rabies diagnostic laboratory workers, cavers, veterinarians and staff, animal control and wildlife workers in rabies enzootic areas, and all persons who frequently handle bats should strongly consider pre-exposure vaccination, which consists of three vaccinations, given on days 0, 7, and 21 or 28. Receiving pre-exposure prophylaxis does not eliminate the need for rabies evaluation after a potential rabies exposure. However, if post-exposure prophylaxis is warranted, there is no use of HRIG and fewer doses of vaccine are needed following the exposure.

Post-Exposure Prophylaxis (PEP)

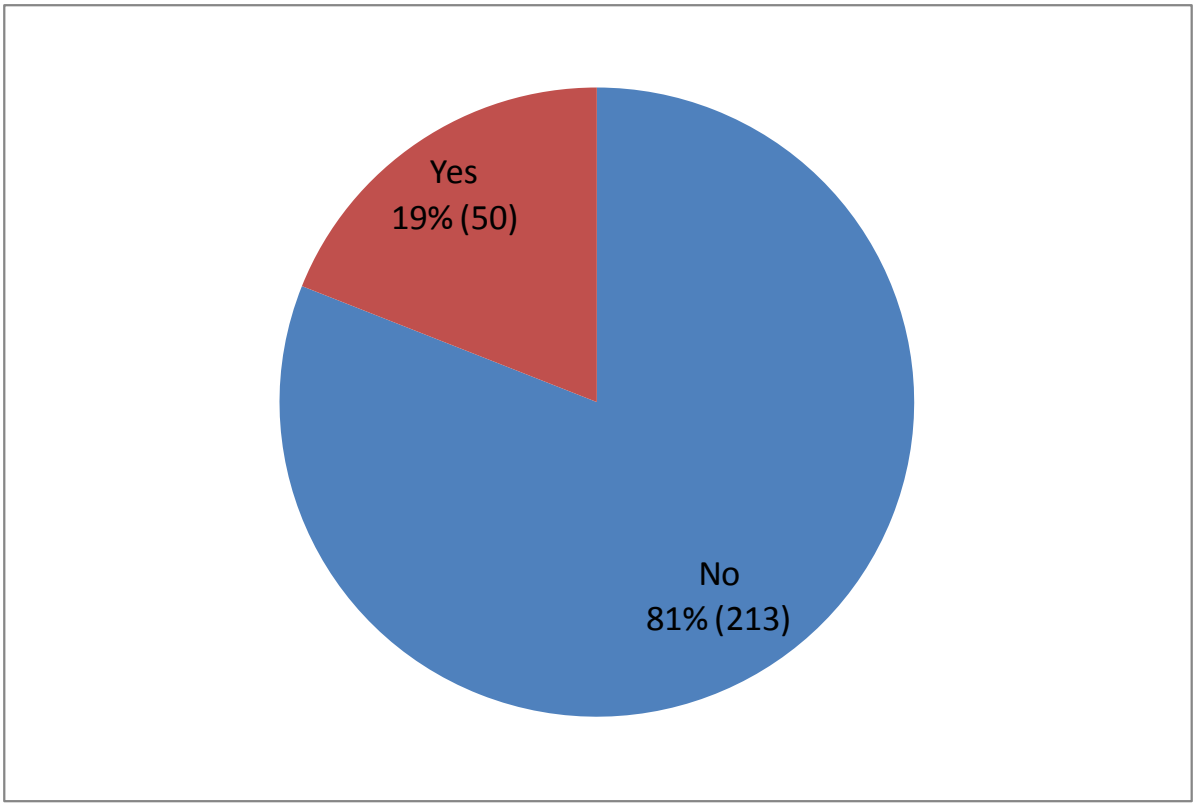
Rabies post-exposure prophylaxis (PEP) is given to individuals who have had an interaction with an animal at high risk for rabies that has either tested positive for rabies or cannot be tested. High risk animals in Maricopa County and Arizona include bats, coyotes, bobcats, skunks and foxes. In 2009, of the 263 rabies risk assessments conducted, MCDPH recommended starting PEP in 50 of these assessments (**Figure 6**). Bites and open wound exposure to saliva or body fluids from these animals are considered high risk and individuals with these types of exposures should see a medical provider as soon as possible.

All post-exposure management should begin with immediate thorough cleansing of all wounds with soap and water. If available, a virucidal agent should be used to irrigate the wounds to decrease the chances of infection. This may also aid in reducing the likelihood of rabies. Whenever possible, bite injuries should not be sutured to avoid further and/or deeper contamination. Tetanus prophylaxis and antibiotics should be given as indicated. Public health officials should be notified immediately of such an incident to conduct a rabies risk assessment to determine if post-exposure prophylaxis is warranted. Post-exposure prophylaxis (for persons who have never been vaccinated for rabies) consists of HRIG and four vaccinations, given on days 0, 3, 7 and 14. HRIG is only provided one time, most often on day 0, but may be given up to seven days after the first dose of vaccine.

Human Rabies Immunoglobulin (HRIG)

HRIG is given in conjunction with post-exposure prophylaxis to individuals who have *not* been previously vaccinated. HRIG works by immediately boosting the body's immune system against rabies while the body builds a natural response to the vaccine. *HRIG alone is not adequate for post-exposure protection*. It can be given up to seven days after the first dose of vaccine. After this time, HRIG is not necessary and may actually inhibit the strength or rapidity of an expected immune response.

Figure 6. Human exposures to all animals reported to the Maricopa County Department of Public Health for rabies risk assessments in 2009 by MCDPH PEP recommendation (n = 263)†



†*Source: Maricopa County Department of Public Health (MCDPH) data*

Rabies Resources

Maricopa County Department of Public Health (MCDPH)

MCDPH Rabies Website
Available at: http://www.maricopa.gov/publichealth/programs/rabies/

Arizona Department of Health Services (ADHS)

Arizona Manual for Rabies Control and Bite Management
Available at: http://www.azdhs.gov/phs/oids/vector/pdf/manual06.pdf

ADHS Rabies Website
Available at: http://www.azdhs.gov/phs/oids/vector/rabies/

Centers for Disease Control & Prevention (CDC)

Human Rabies Prevention – United States, 2008
Recommendations of the Advisory Committee on Immunization Practices (ACIP)
MMWR 2008; 57: (No. RR-3)
Available at: http://www.cdc.gov/mmwr/PDF/rr/rr5703.pdf

Use of a Reduced (4-Dose) Vaccine Schedule for Postexposure Prophylaxis to Prevent Human Rabies.
Recommendations of the Advisory Committee on Immunization Practices (ACIP).
MMWWR 2010; 59: (No. RR-2)
Available at: http://www.cdc.gov/mmwr/pdf/rr/rr5902.pdf

CDC Rabies Website
Available at: http://www.cdc.gov/rabies

MARICOPA COUNTY PROVIDES RISK ASSESSMENTS FOR *ALL ANIMAL BITES*.

Please call Maricopa County to report ALL suspected rabies cases and ALL animal bites!

To report a suspected rabies case or to receive a rabies risk assessment	
24 hours a day	**602-747-7111**

To report an animal bite to Maricopa County Animal Care and Control	
24 hours a day	**602-506-7387**

Department of Public Health, Office Epidemiology
4041 N Central Ave. Ste 600 Phoenix, AZ 85012 Ph: 602-372-2605